

## **271119-TC**

### **Termination Blocks and Patch Panels for Telecommunications Systems**

#### **Part 1 - General**

##### **1.1 Work Included**

- A. Provide all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents

##### **1.2 Scope of Work**

- A. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling. Termination blocks and patch panels are covered under this document.
- B. The Communication Equipment Room shall support a minimum of (4) 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the Telecommunications Room (TR) located on the same floor, and routed to the appropriate rack serving that area and terminated as specified in this document.
- C. This section includes minimum requirements for the following:
  - Termination blocks
  - Patch panels
- D. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the telecommunications contractor as detailed in this document.
- E. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document. If the bid documents are in conflict, this specification shall take precedence. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

### 1.3 Regulatory References

- A. The following industry standards are the basis for the structured cabling system described in this document.

1. TIA/EIA

TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
TIA/EIA-569-A	Commercial Building Standard for Telecom Pathways and Spaces
TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
TIA/EIA-607	Commercial Building Grounding/Bonding Requirements

NFPA

NFPA-70	National Electric Code (NEC)-1999
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ISO/IEC

ISO/IEC 11801	Generic Cabling for Customer Premises
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- B. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

### 1.4 Cable Termination Hardware – Category 6

Each horizontal or backbone cabling run will be terminated using appropriate connectors or connecting blocks depending upon the cable type. Matching patch cords will be used to perform cross-connect activities or to connect into the networking/voice hardware.

Category 6 Unshielded Twisted Pair UTP. Four-pair Category 6 cabling shall be terminated onto modular patch panels, punch down style patch panels or punch down style connecting blocks where specified in the plans.

Four-pair Category 6 UTP cabling shall be terminated onto a four-pair Category 6 module. All modules shall be terminated using the T568B wiring scheme. The eight-position module shall exceed the connector requirements of the TIA/EIA Category 6 standard.

Products shall provide labeling options that comply with the TIA/EIA-606-A Standard. All products shall be clearly identified with the use of a thermal transfer printer, hand-printed labels are not acceptable and will be rejected. Products shall include faceplates, surface mount boxes, patch panels, marker ties, printers and accessories. All label heights shall be the same to allow for consistent labeling. Panels shall be available in flat and angled versions.

Modular Patch Panels shall be of a metal design with 48 ports. Patch panels shall be available with and without labels.

Part Number	Number of Ports	Ports Per Faceplate	Rack Spaces
	48	2	2

## 1.5 Cable Termination Hardware – Category 6

Four-pair Category 6 cabling shall be terminated onto modular patch panels ('110 style patch panels punch down style connecting bases and connectors) for specific applications as outlined in this specification.

Four-pair Category 6 UTP cabling shall be terminated onto a four-pair Category 6 module. All modules shall be terminated using the T568B wiring scheme. The eight position modules shall exceed the connector requirements of the TIA/EIA Category 6 standard.

Products shall provide labeling options that comply with the TIA/EIA-606-A Standard. . All products shall be clearly identified with the use of a thermal transfer printer, hand-printed labels are not acceptable and will be rejected. Products shall include faceplates, surface mount boxes, patch panels, marker ties, printers and accessories. All label heights shall be the same to allow for consistent labeling. Panels shall be available in flat and angled versions.

Patch Panels - Four-pair Category 6 UTP cabling shall be terminated onto four-pair punch down style connecting hardware mounted to the rear of integral patch panels and routed to Category 6 modules on the front face of the patch panel. Patch panels shall be universal for T658A and T568B wiring configurations. Integral cable tie mounts shall be included in the panel for cable management on the back of the panel. Port and panels shall be easy to identify with write-on areas and optional label holder for color-coded labels. Rack mountable patch panels shall mount to standard EIA 19" and 23" racks.

Part Number	Number of Ports	Wiring Configuration	Rack Spaces
	48	Universal	2

## Part 2 - Execution

### 2.1 Horizontal Cross Connect Installation

Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.

Pair untwist at the termination shall not exceed 0.5".

Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

Cables shall be neatly bundled groups of 48 max and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

The cable jacket shall be maintained as close as possible to the termination point.

Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

## **2.2 Copper Termination Hardware**

Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practice.

Pair untwist at the termination shall not exceed 0.5".

Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

Cables shall be neatly bundled in groups of 48 max and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

The cable jacket shall be maintained to within 25 mm (one inch) of the termination point.

Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

## **2.3 Testing and Acceptance**

### **A. General**

1. All cables shall be labeled prior to testing. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-A. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

## B. Copper Channel Testing

All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a level IIe or level III test unit for category 6 or category 6 performance compliance, respectively.

**Continuity** - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

**Length** - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-B Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

### Category 6 & 6 Performance

Follow the Standards requirements established in:

- ANSI/TIA/EIA-568-B -TSB-155

A level IV or better test unit is required to verify category 6 performances and must be updated to include the requirements of TSB-155. A level IV test unit is required to verify category 6 performances. Refer to section on test equipment for additional requirements.

The four basic tests required in TSB-67 are:

- Wire Map
- Length
- Attenuation
- NEXT (Near end crosstalk)

Four additional tests are required per TSB-155:

- Return Loss
- ELFEXT Loss
- Propagation Delay
- Delay skew

two additional tests are required:

- PSNEXT (Power sum near-end crosstalk loss)
- PSELFEXT (Power sum equal level far-end crosstalk loss)

## **2.4 System Documentation**

- A. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.
- B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.
- C. MAA/OT may do a 10% random field re-test be conducted on the cable system to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.
- D. Test Results documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a

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record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

- E. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B including applicable TSB's and amendments. The appropriate level IV tester shall be used to verify Category 6 cabling systems. The appropriate level III tester shall be used to verify Category 6 cabling systems.
- F. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form (compact disc). These discs shall contain the electronic equivalent of the test results as defined by the bid specification and be of a format readable from Microsoft Word or Microsoft Excel.
- G. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.



- H. The **As-Built** drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner. Numbering, icons, pathways and other drawing conventions are to be assigned their own individual AutoCAD layer.
- I. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD or as agreed to by MAA/OT) form.